Running Global Model Parallel Experiments

* Internal NCEP users *

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NOAA/NWS/NCEP/EMC
Global Climate and Weather Modeling Branch

Welcome!

So you'd like to run a GFS experiment? This document will help get you going and provide information on running global model parallel experiments, whether it be on Vapor or one of the CCS machines.

Before continuing, some information:

- This document is for users who can access the R&D (Vapor) or CSS (Cirrus/Stratus) NCEP machines.
- This document assumes you are new to using the GFS model and running GFS experiments but that you are accustom to the NCEP computing environment.
- If at any time you are confused and can't find the information that you need please email:
  - ncep.list.emc.glopara-support@noaa.gov
- Also, for Global Model Parallel support feel free to subscribe to the following glopara listservs:
  - Glopara support https://lstsrv.ncep.noaa.gov/mailman/listinfo/ncep.list.emc.glopara-support
  - Glopara announcements https://lstsrv.ncep.noaa.gov/mailman/listinfo/ncep.list.emc.glopara-announce
- For Global Spectral Model (GSM) documentation:
  - http://www.emc.ncep.noaa.gov/GFS/doc.php

Table of Contents:

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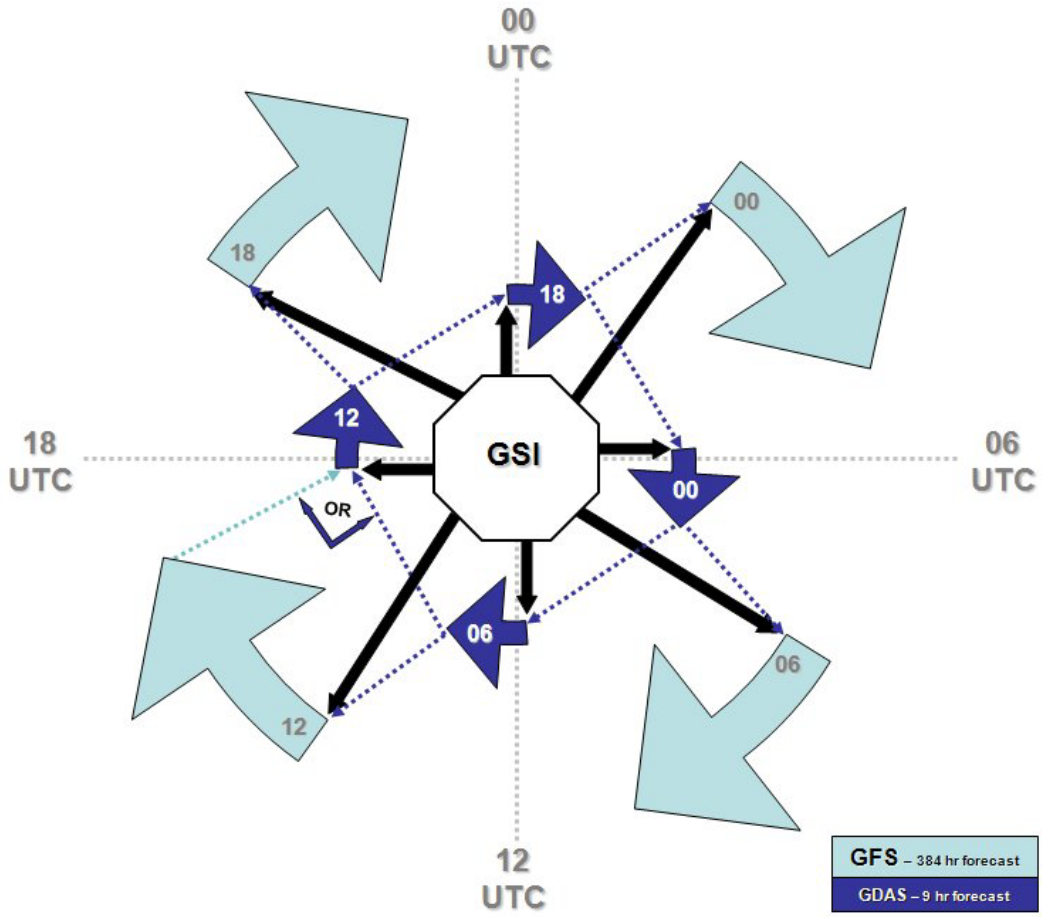
Operational Global Forecast System (GFS) Overview:

The Global Forecast System (GFS) is a three-dimensional hydrostatic global spectral model run operationally at NCEP. The GFS consists of two runs per six-hour cycle (00, 06, 12, and 18 UTC), the "early run" **gfs** and the "final run" **gdas**. Both the terms "**GFS**" and "**GDAS**" will take on two meanings in this document.

GFS	(all caps) refers to the entire Global Forecast System suite of jobs (see flow diagram in next section), which encompasses the **gfs** (next bullet) and **gdas**.
gfs	(all lower case) refers to the "early run". In real time, the early run, is initiated approximately 2 hours and 45 minutes after the cycle time. The early **gfs** run gets the full forecasts delivered in a reasonable amount of time.
GDAS	(all caps) refers to the Global Data Assimilation System.
gdas	(all lower case) refers to the "final run", which is initiated approximately six hours after the cycle time.. The delayed **gdas** allows for the assimilation of later arriving data. The **gdas** run includes a short forecast (nine hours) to provide the first guess to both the **gfs** and **gdas** for the following cycle.

Timeline of GFS and GDAS*:



* Times are approximate

Each operational run consists of six main steps*:

dump**	Gathers required (or useful) observed data and boundary condition fields (done during the operational GFS run); used in real-time runs, already completed for archived runs.
storm relocation***	In the presense of tropical cyclones this step adjusts previous gdas forecasts if needed to serve as guess fields. For more info, see the relocation section of Dennis Keyser's Observational Data Dumping at NCEP document.
prep	Prepares the data for use in the analysis (including quality control, bias corrections, and assignment of data errors) For more info, see Dennis Keyser's PREPBUFR PROCESSING AT NCEP document.
analysis	Runs the data assimilation (currently, Gridpoint Statistical Interpolation, or GSI)
forecast	From the resulting analysis field, runs the forecast model out to specified number of hours (9 for gdas, 384 for gfs)
post	Converts resulting analysis and forecast fields to WMO grib for use by other models and external users.

* Additional steps run in experimental mode are the verification (gfsvrfy/gdasvrfy) and archive (gfsarch/gdasarch) jobs (pink boxes in flow diagram in next section).
** Unless you are running your experiment in real-time, the dump steps have already been completed by the operational system (gdas and gfs) and the data is already waiting in a directory referred to as the dump archive.
*** The storm relocation step is included in the prep step (gfsprep/gdasprep) for experimental runs.

Next page – Global Forecast System Experiment Overview

Global Forecast System (GFS) Experiment Overview:

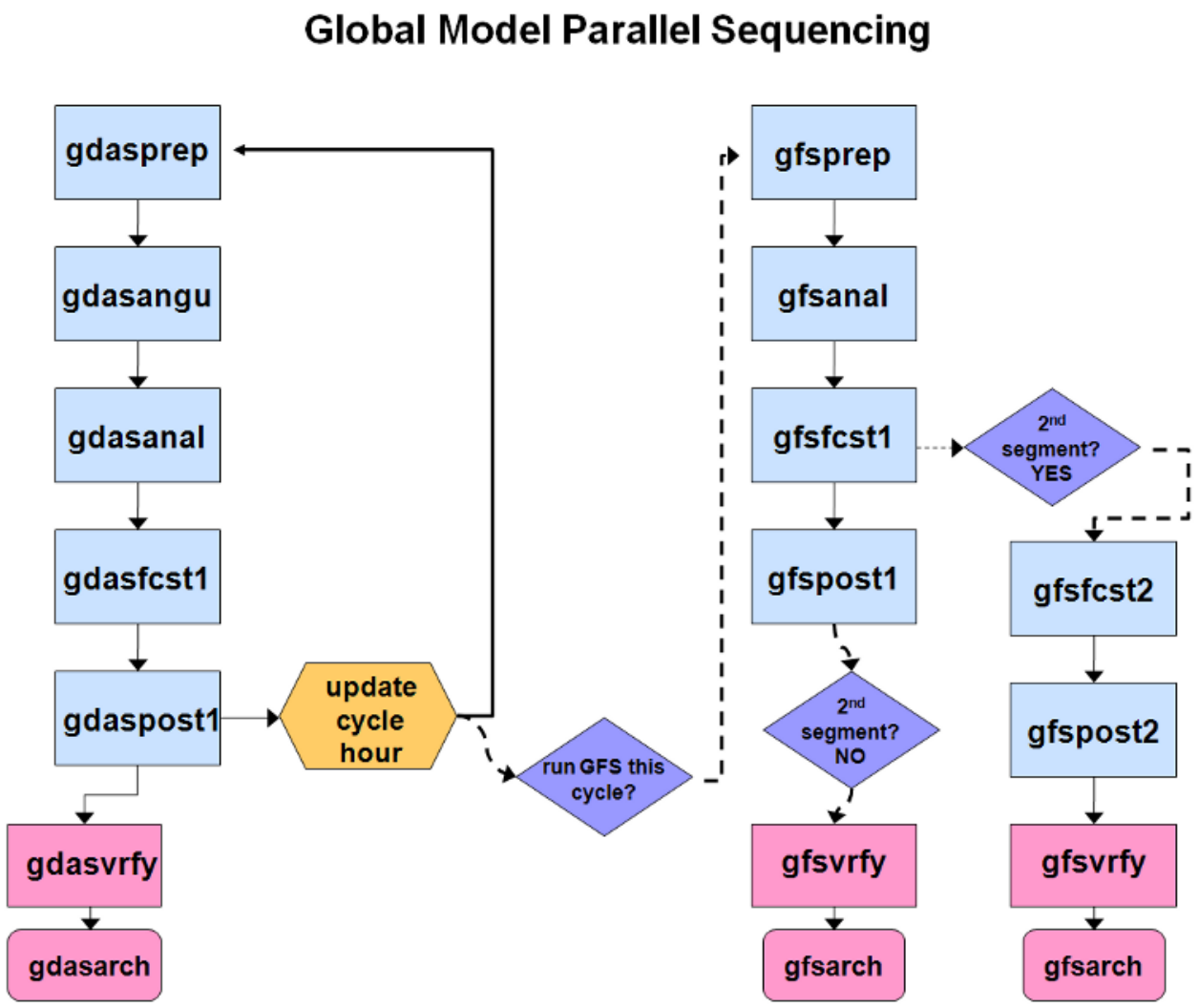


Image 1: Flow diagram of a typical experiment

GFS experiments employ the global model parallel sequencing (shown above). The system utilizes a collection of job scripts that perform the tasks for each step. A job script runs each step and initiates the next job in the sequence.

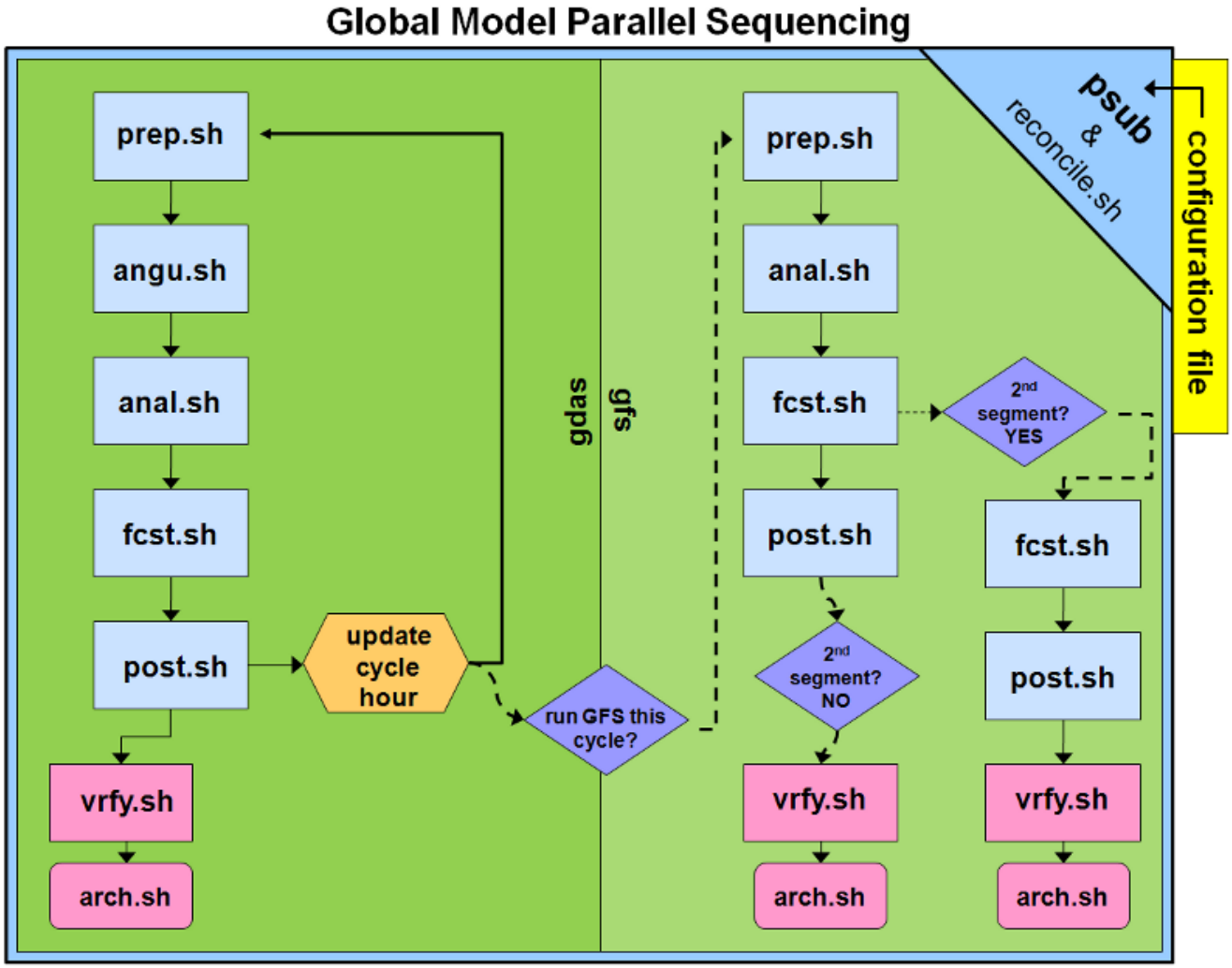
Example: When the prep job finishes it submits the analysis job. When the analysis job finishes it submits the forecast job, etc.

As with the operational system, the **gdas** provides the guess fields for the **gfs**. The **gdas** runs for each cycle (00, 06, 12, and 18 UTC), however, to save time and space in experiments the **gfs** (right side of the diagram) is initially setup to run for only the 00 UTC cycle. (See the "run GFS this cycle?" portion of the diagram) The option to run the GFS for all four cycles is available (see gfs_cyc variable in configuration file).

The steps described in the table on page four are the main steps for a typical operational run. An experimental run is different from operations in the following ways:

- Dump step is not run as it has already been completed during the real-time production runs
- Addition steps in experimental mode:
  - verification (vrfy)
  - archive (arch)

Image 1 above can be further expanded to show the scripts/files involved in the process:



The next pages will provide information on the following:

- Experimental job scripts
- Setting up your experiment
- Additional notes and utilities

Main Directories for Experimental Scripts:

`/mtb/save/glopara/trunk/para` (vapor)
`/global/save/glopara/trunk/para` (cirrus/stratus)

Subdirectories:

/bin These scripts control the flow of an experiment.

psub	Submits parallel jobs (check here for variables that determine resource usage, wall clock limit, etc).
pbeg	Runs when parallel jobs begin.
perr	Runs when parallel jobs fail.
pend	Runs when parallel jobs end.
plog	Logs parallel jobs.
pcop	Copies files from one directory to another.
pmkr	Makes the rlist, the list of data flow for the experiment.
pcon	Searches standard input (typically rlist) for given pattern (left of equal sign) and returns assigned value (right of equal sign). Generally called within other utilities.
pcne	Counts non-existent files

/jobs These scripts, combined with variable definitions set in configuration, are similar in function to the wrapper scripts in /nwprod/jobs, and call the main driver scripts.

prep.sh	Runs the data preprocessing prior to the analysis (storm relocation if needed and generation of prepbufr file).
angu.sh	Angle update script, additional step in analysis.
anal.sh	Runs the analysis. (Default ex-script does the following: 1) update surface guess file via global_cycle to create surface analysis; 2) runs the atmospheric analysis (global_gsi); 3) updates the angle dependent bias (satang file))
fcst.sh	Runs the forecast.
post.sh	Runs the post processor.
vrfy.sh	Runs the verification step.
arch.sh	Archives select files (online and hpss) and cleans up older data.
dump.sh	Retrieves dump files (not used in a typical parallel run).
dcop.sh	This script sometimes runs after dump.sh and retrieves data assimilation files.
copy.sh	Copies restart files. Used if restart files aren't in the run directory.

/exp This directory typically contains config files for various experiments and some rlists.

Filenames with "config" in the name are configuration files for various experiments. Files ending in "rlist" are used to define mandatory and optional input and output files and files to be archived.

/scripts - Development versions of the the main driver scripts.

The production version of these scripts are in /nwprod/scripts.

/ush - Additional scripts pertinent to the model typically called from within the main driver scripts also includes:

reconcile.sh	This script sets required, but unset variables to default values.

Setting up an Experiment:

Steps:

1. Do you have restricted data access? If not go to the following webpage and submit a registration form to be added to group rstprod: http://www.nco.ncep.noaa.gov/sib/restricted_data/restricted_data_sib/
2. Terms and other items to know about
3. Set up experiment configuration file
4. Set up rlist
5. Submit first job

Additional information:

- Data file names (glopara vs production) (see appendix A)
- Global model variables (see appendix B)
- Finding GDAS/GFS production files (see appendix C)

Terms and other items to know about:

configuration file	List of variables to be used in experiment and their configuration/value. The user can change these variables for their experiment. See Appendix B.
job	A script, combined with variable definitions set in configuration, which is similar in function to the wrapper scripts in /nwprod/jobs, and which calls the main driver scripts. Each box in above diagram is a job.
pr	Acronym for parallel experiments. Experiment names should look like: pr$PSLOT ($PSLOT is described in the next section)
reconcile.sh	Similar to the configuration file, the reconcile.sh script sets required, but unset variables to default values.
rlist	List of data to be used in experiment. Created in reconcile.sh (when the pmkr script is run) if it does not already exist at beginning of experiment.
rotating directory (a.k.a. ROTDIR and COMROT)	Typically your "noscrub" directory is where the data and files from your experiment will be stored. Set in configuration file. Ex: /global/noscrub/wx24kh/prtest --> /global/noscrub/$LOGNAME/pr$PSLOT

Setting up experiment configuration file:

The following files have settings that will produce results that match production results. Copy this file, or any other configuration file you wish to start working with, to your own space and modify it as needed for your experiment.

Please review README file in sample configuration file location for more information.

Sample config file	Vapor /mtb/save/glopara/trunk/para/exp	Cirrus/Stratus /global/save/glopara/trunk/para/exp
Valid 5/9/11 - present	para_config_gfs	para_config_gfs
Valid 5/9/11 - present	para_config_gfs_prod*	para_config_gfs_prod*

* setup to match production forecast and post processed output

Make sure to change the following user specific configuration file variables, found near the top of the configuration file:

ACCOUNT	LoadLeveler account, i.e., GFS-MTN (see more examples below for ACCOUNT, CUE2RUN, and GROUP)
ARCDIR	Online archive directory (i.e. ROTDIR/archive/prPSLOT)
ATARDIR	HPSS tape archive directory (see configuration file for example)
COMROT	Rotating/working directory. Also see ROTDIR description
CUE2RUN	LoadLeveler class for parallel jobs (i.e., dev) (see more examples of CUE2RUN below)
EDATE	Analysis/forecast cycle ending date (YYYYMMDDCC, where CC is the cycle)
EDUMP	Cycle ending dump (gdas or gfs)
ESTEP	Cycle ending step (prep, anal, fcst1, post1, etc.)
EXPDIR	Experiment directory under save, where your configuraton file, rlist, runlog, and other experiment scripts sit.
GROUP	LoadLeveler group (i.e., g01) (see more examples of GROUP below)
PSLOT	Experiment ID (change this to something unique for your experiment)
ROTDIR	Rotating/working directory for model data and i/o. Related to COMROT. (i.e. /global/noscrub/wx24kh/prPSLOT)

A description of *some* global model variables that you may wish to change for your experiment can be found in Appendix B.

	Variable	Global/GFS		JCSDA
ACCOUNT examples	**ACCOUNT**	GFS-MTN (C/S)	MTB001-RES (V)	JCSDA008-RES
	CUE2RUN	class1 (C/S)	mtb (V)	jcsda
	GROUP	g01 (C/S)	mtb (V)	jcsda

* C = Cirrus, S = Stratus, V = Vapor

Please make sure to take a look at the current reconcile script to assure that any changes you made in the configuration file are not overwritten. The reconcile script runs after reading in the configuration file settings and sets default values for many variables that may or may not be defined in the configuration file. If there are any default choices in reconcile that are not ideal for your experiment make sure to set those in your configuration file, perhaps even at the end of the file after reconcile has been run.

Setting up an rlist:

If you do not want to use the rlist generated by reconcile.sh and wish to create your own, you could start with an existing rlist and modify it by hand as needed. Some samples exist in the exp subdirectory:

```
Vapor:
/mtb/save/glopara/trunk/para/exp/prtrunktest0.gsi.rlist.sample*
Cirrus/Stratus:
/global/save/glopara/trunk/para/exp/prtrunktest0.gsi.rlist.sample*
```

* The sample rlist files already contain the append.rlist entries.

A brief overview of the rlist format can be found in Appendix D.

If the rlist file does not exist when a job is submitted, pmkr will generate one based on your experiment configuration. When creating the rlist on the fly, check the resulting file carefully after that first job is complete to ensure all required files are represented. If you find anything missing, you can manually edit the rlist using your favorite text editor and then continue the experiment from that point.

The pmkr script does not account for files to be archived (eg, ARCR, ARCO, ARCA entries). The current standard practice is to put those entries in a separate file. Eg, see:

```
Vapor: /mtb/save/glopara/trunk/para/exp/append.rlist
Cirrus/Stratus: /global/save/glopara/trunk/para/exp/append.rlist
```

Then define variable **$append_rlist** to point to this file.

If the variable **$ARCHIVE** is set to YES (the default is NO), this file is then appended automatically to the rlist by reconcile.sh, but ***only*** when the rlist is generated on the fly by pmkr. So, eg, if you submit the first job, which creates an rlist and then you realize that your ARCx entries are missing, creating the append_rlist after the fact won't help *unless* you remove the now existing rlist. If you delete the errant rlist (and set **$ARCHIVE** to YES, the next job you submit will see that the rlist does not exist, create it using pmkr, then append the **$append_rlist** file.

Also, along those lines, you may find that pmkr does not account for some new or development files. You can list those needed entries in the file pointed to by variable **$ALIST**. The difference between $ALIST and $append_rlist is that the latter only gets appended if variable **$ARCHIVE** is YES.

Got all that?? (Now you know why it is sometimes easier to start with an existing rlist).

To submit first job:

a) Using submit script (else see b)

1) Obtain a copy of submit.sh from:
   /mtb/save/glopara/trunk/para/exp (Vapor)
   /global/save/glopara/trunk/para/exp (Cirrus/Stratus)
2) Save submit.sh in your **EXPDIR**
3) From your **EXPDIR**, run submit.sh:
   ./submit.sh $CONFIG $CDATE $CDUMP $CSTEP
4) This script kicks off experiment.

b) Manually

1) Create directory **ROTDIR** (defined in configuration file)
2) Acquire required forcing files and place in **ROTDIR**:
   1) biascr.$CDUMP.$CDATE
   2) satang.$CDUMP.$CDATE
   3) sfcanl.$CDUMP.$CDATE
   4) siganl.$CDUMP.$CDATE
      (More about finding the required files can be found in Appendix C)
3) From **EXPDIR**, on command line type:

   $PSUB $CONFIG YYYYMMDDCC $CDUMP $CSTEP

   Where:
   $PSUB = psub script with full location path, *see configuration file for psub script to use*.
   $CONFIG = name of configuration file (assumes the file is in your COMROT)
   YYYYMMDDCC = initial/starting year (YYYY), month (MM), day (DD), and cycle (CC) for model run
   $CDUMP = dump (gdas or gfs) to start run
   $CSTEP = initial model run step (see flow diagram above for options)
   Ex: /global/save/wx23sm/para_scripts/cver_1.1/bin/psub para_config 2007080100 gdas fcst1

Additional information about running an experiment:

- Remember that since each job script starts the next job, you need to define ESTEP as the job that follows the step which you wish to end on. For example: You want to finish when the forecast has completed and the files are processed...your ESTEP could be "prep", which is the first step of the next cycle.
- The script "psub" kicks off the experiment and each parallel sequenced job.

To check the status of your experiment/jobs, check out the load leveler queue by typing "llq" on the command line.

llq	Load leveler queue
llq -l	More information
llq -u $LOGNAME	Status of jobs running by user $LOGNAME (your username)

Experiment Troubleshooting:

As model implementations occur, ensure that you are using up-to-date versions of scripts/code and configuration file for your experiment. For instance, don't use the newest production executables with older job scripts. Changes may have been made to the production versions that will impact your experiment but may not be obvious.

For problems with your experiment please contact: ncep.list.emc.glopara-support
Please make sure to provide the following information in the email:

- Machine you are working on (Vapor, Cirrus or Stratus)
- **EXPDIR**, working directory location
- Configuration file name and location
- Any other specific information pertaining to your problem, i.e., dayfile name and/or location.

Related utilities:

Some information on some useful related utilities can be found at:

copygb.info	copygb copies all or part of one GRIB file to another GRIB file, interpolating if necessary
sfchdr.info	global_sfchdr prints information from the header of a surface file
sighdr.info	global_sighdr prints information from the header of a sigma file
ss2gg.info	ss2gg converts a sigma file to a grads binary file and creates a corresponding descriptor (ctl) file

Notes:

USING OLD CONFIGURATION FILES WITH NEW SCRIPTS:

There are many sets of these scripts to run the global model. Some are several years old. There have been a number of contributers, each with their own programming style and set of priorities. If you have a configuration file that worked with one set of scripts, don't expect that same file to do what you want with a different set of scripts. Variables that used to do what you want, may no longer do anything or default settings may change. So, look over the set of scripts you are using to see what changes might be needed and then check your output carefully.

RECONCILE:

If info added to alist after rlist has been generated, that rlist must be removed/renamed. Otherwise info from alist won't be picked up.

CLEAN UP:

Disk space is often at a premium. The arch.sh job scrubs older files based on the settings of the various HRK* variables. Adjust those values as suits your needs and space limitations. If you find your older data is not getting scrubbed, check that the archive jobs for that dump are running. If they are, check arch dayfile output to determine which cycles those jobs are attempting to scrub. (If you are running, only 00Z gfs cycles, ensure your HRK values are all some multiple of 24). If some archive jobs are not getting submitted at all, check that the vrfy.sh job is completing. (...a common culprit). Note also, if you are copying select files to an online archive in delayed mode (ARCHDAY is often set to 2 days for real-time runs), be sure your HRK values for those files is sufficient such that those files are copied to the online archive before they are scrubbed. (HRKROT handles files that are typically copied to an online archive).

COPY:

copy.sh will call chgres for first guess fields even if no change is needed unless COPYCH=NO (or anything other than "YES")

PATH:

Some scripts assume that "." is included in the users PATH. Check for this if unexpected errors occur. (The error msg isn't always clear).

Appendix A

Files used in Global Model parallel scripts

As of November 7, 2000, the global parallels are run on the NCEP IBM SP Phase II computer and that is where its files reside. Many of the parallel files are in GRIB or BUFR formats, the WMO standard for gridded and ungridded meteorological data, respectively. Other parallel files such as restart files are in flat binary format, and are not generally intended to be accessed by the general user.

Unfortunately but predictably, the global parallel follows a different file naming convention than the operational file naming convention. (The global parallel file naming convention started in 1990 and predates the operational file naming convention.)

The global parallel file naming convention is a file type followed by a period, the run (gdas or gfs), and the 10-digit current date $CDATE in YYYYMMDDHH form. (Eg, **pgbf06.gfs.2008060400**). Some names may have a suffix, for instance if the file is compressed.

For the sake of users that are accustomed to working with production files or those who want to do comparisons, the equivalent production file name info is included here. Production file naming convention is the run followed by a period, the cycle name, followed by a period, and the file type. (Eg, **gfs.t00z.pgrbf06**). In the table below, only the file type is listed for production names.

The files are divided into the categories restart files, observation files, and diagnostic files. Some files may appear in more than one category. Some verification files in the diagnostics table do not include a run qualifier.

Restart files

glopara filename	**file description**	**production base name** ***(eg, gdas1.t00z .prepbufr)***	**format**
prepqc.$CDUMP.$CDATE	Conventional Observations with quality control	prepbufr	BUFR
biascr.$CDUMP.$CDATE	Time dependent sat bias correction file	abias	text
satang.$CDUMP.$CDATE	Angle dependent sat bias correction	satang	text
sfcanl.$CDUMP.$CDATE	surface analysis	sfcanl	binary
siganl.$CDUMP.$CDATE	atmospheric analysis (aka sigma file)	sanl	binary
sfcf$FF.$CDUMP.$CDATE	surface boundary condition at forecast hour $FF	bf$FF	binary
sig$FF.$CDUMP.$CDATE	atmospheric model data at forecast hour $FF	sf$FF	binary
pgbanl.$CDUMP.$CDATE	pressure level data from analysis	pgrbanl	GRIB
pgbf$FF.$CDUMP.$CDATE	pressure level data from forecast hour $FF	pgrbf$FF	GRIB

Observation files			
glopara filename	**file description**	**production base name *(eg, gdas1.t00z.engicegrb)***	**format**
icegrb.$CDUMP.$CDATE	Sea Ice Analysis	engicegrb	GRIB
snogrb.$CDUMP.$CDATE	Snow Analysis	snogrb	GRIB
snogrb_t382.$CDUMP.$CDATE	Snow Analysis on T382 grid	snogrb_t382	GRIB
sstgrb.$CDUMP.$CDATE	Sea Surface Temperature Analysis	sstgrb	GRIB
tcvitl.$CDUMP.$CDATE	Tropical Storm Vitals	syndata.tcvitals.tm00	text
adpsfc.$CDUMP.$CDATE	Surface land	adpsfc.tm00.bufr_d	BUFR
adpupa.$CDUMP.$CDATE	Upper-air	adpupa.tm00.bufr_d	BUFR
proflr.$CDUMP.$CDATE	Wind Profiler	proflr.tm00.bufr_d	BUFR
aircar.$CDUMP.$CDATE	MDCRS ACARS Aircraft	aircar.tm00.bufr_d	BUFR
aircft.$CDUMP.$CDATE	Aircraft	aircft.tm00.bufr_d	BUFR
sfcshp.$CDUMP.$CDATE	Surface marine	sfcshp.tm00.bufr_d	BUFR
sfcbog.$CDUMP.$CDATE	Mean Sea-level Pressure bogus reports	sfcbog.tm00.bufr_d	BUFR
satwnd.$CDUMP.$CDATE	Satellite-derived wind repors	satwnd.tm00.bufr_d	BUFR
vadwnd.$CDUMP.$CDATE	VAD (NEXRAD) wind	vadwnd.tm00.bufr_d	BUFR
goesnd.$CDUMP.$CDATE	GOES Satellite data	goesnd.tm00.bufr_d	BUFR
spssmi.$CDUMP.$CDATE	SSM/I Retrievals	spssmi.tm00.bufr_d	BUFR
sptrmm.$CDUMP.$CDATE	TRMM	sptrmm.tm00.bufr_d	BUFR
erscat.$CDUMP.$CDATE	ERS	erscat.tm00.bufr_d	BUFR
qkswnd.$CDUMP.$CDATE	QuikScat	qkswnd.tm00.bufr_d	BUFR
osbuvb.$CDUMP.$CDATE	SBUV layer ozone product (Version 6)	osbuv.tm00.bufr_d	BUFR
osbuv8.$CDUMP.$CDATE	SBUV layer ozone product (Version 8)	osbuv8.tm00.bufr_d	BUFR
mtiasi.$CDUMP.$CDATE	METOP-2 IASI 1C radiance data (variable channels)	mtiasi.tm00.bufr_d	BUFR
ascatw.$CDUMP.$CDATE	METOP 50 KM ASCAT scatterometer data (reprocessed by wave_dcodquikscat)	ascatw.tm00.bufr_d	BUFR
geoimr.$CDUMP.$CDATE	GOES 11x17 fov imager clear radiances	geoimr.tm00.bufr_d	BUFR
1bmsu.$CDUMP.$CDATE	MSU NCEP-processed brightness temps	1bmsu.tm00.bufr_d	BUFR
1bhrs2.$CDUMP.$CDATE	HIRS-2 NCEP-processed	1bhrs2.tm00.bufr_d	BUFR

	brightness temps		
1bhrs3.$CDUMP.$CDATE	HIRS-3 NCEP-processed brightness temps	1bhrs3.tm00.bufr_d	BUFR
1bamua.$CDUMP.$CDATE	AMSU-A NCEP-proc. br. temps	1bamua.tm00.bufr_d	BUFR
1bamub.$CDUMP.$CDATE	AMSU-B NCEP-processed brightness temps	1bamub.tm00.bufr_d	BUFR
airs.$CDUMP.$CDATE	AQUA AIRS/AMSU-A/HSB proc. btemps-center FOV	airs.tm00.bufr_d	BUFR
airswm.$CDUMP.$CDATE	AQUA-AIRS AIRS/AMSU-A/HSB proc btemps-warmest FOV	airswm.tm00.bufr_d	BUFR
ssmit.$CDUMP.$CDATE	SSM/I brightness temperatures	ssmit.tm00.bufr_d	BUFR
1bhrs4.$CDUMP.$CDATE	HIRS-4 1b radiances	1bhrs4.tm00.bufr_d	BUFR
1bmhs.$CDUMP.$CDATE	MHS NCEP-processed br. temp	1bmhs.tm00.bufr_d	BUFR
airsev.$CDUMP.$CDATE	AQUA-AIRS AIRS/AMSU-A/HSB proc. btemps- every FOV	airsev.tm00.bufr_d	BUFR
goesfv.$CDUMP.$CDATE	GOES 1x1 fov sounder radiances	goesfv.tm00.bufr_d	BUFR
gpsro.$CDUMP.$CDATE	GPS radio occultation data	gpsro.tm00.bufr_d	BUFR
gpsipw.$CDUMP.$CDATE	GPS - Integrated Precipitable Water	gpsipw.tm00.bufr_d	BUFR
wdsatr.$CDUMP.$CDATE	WindSat scatterometer data from NESDIS (reprocessed)	wdsatr.tm00.bufr_d	BUFR
wndsat.$CDUMP.$CDATE	WindSat scatterometer data from FNMOC	wndsat.tm00.bufr_d	BUFR
rassda.$CDUMP.$CDATE	Radio Acoustic Sounding System Temp Profiles	rassda.tm00.bufr_d	BUFR
statup.$CDUMP.$CDATE	Summary	updated.status.tm00.bufr_d	text
stat01.$CDUMP.$CDATE	Bufr status	status.tm00.bufr_d	text
stat02.$CDUMP.$CDATE	Satellite status	status.tm00.ieee_d	text

Diagnostic Files			
glopara filename	**file description**	**production base name *(eg, gdas1.t00z .gsistat)***	**format**
gsistat.$CDUMP.$CDATE	gsi (obs-ges), qc, and iteration statistics	gsistat	text
radstat.$CDUMP.$CDATE	radiance assimilation statistics	radstat	binary
cnvstat.$CDUMP.$CDATE	conventional observation assimilation statistics	cnvstat	binary
oznstat.$CDUMP.$CDATE	ozone observation assimilation statistics	oznstat	binary
pcpstat.$CDUMP.$CDATE	precipitation assimilation statistics	pscpstat	binary
flxf$FF.$CDUMP.$CDATE	Model fluxes at forecast hour $FF	fluxgrbf$FF	GRIB
logf$FF.$CDUMP.$CDATE	Model logfile at forecast hour $FF	logf$FF	text
tcinform_relocate.$CDUMP.$CDATE	storm relocation information	--	text
tcvitals_relocate.$CDUMP.$CDATE	tropical cyclone vitals	--	text
prepqc.$CDUMP.$CDATE	Conventional Observations with quality control	prepbufr	BUFR
prepqa.gdas.$CDATE	Observations with quality control plus analysis	--	BUFR
prepqf.gdas.$CDATE	Observations with quality control plus forecast	--	BUFR
adpsfc.anl.$CDATE	Surface observation and analysis fit file	--	GrADS
adpsfc.fcs.$CDATE	Surface observation and forecast fit file	--	GrADS
adpupa.mand.anl.$CDATE	Rawinsonde observation and analysis fit file	--	GrADS
adpupa.mand.fcs.$CDATE	Rawinsonde observation and forecast fit file	--	GrADS
sfcshp.anl.$CDATE	Ship observation and analysis fit file	--	GrADS
sfcshp.fcs.$CDATE	Ship observation and forecast fit file	--	GrADS

Appendix B

Below is a list of the groups and their definitions:

ANAL	Analysis step	FCST	Forecast step
ANGU	Angle update step	GENERAL	User, experiment setup, and other general parallel
ARCH	Archive step	POST	system variables
AVRG	Averaging step	PREP	Post processing step
COMP	Computing variables	TRAK	Pre-processing (prep) step
COPY	Copy step	VRFY	Tracker scripts, within verification step
DUMP	Data dump step		Verification step

VARIABLE	GROUP	DESCRIPTION
ACCOUNT	GENERAL	LoadLeveler account, i.e. GFS-MTN
adiab	FCST	Debugging, true=run adiabatically
AERODIR	FCST	Directory, usually set to $FIX_RAD, see $FIX_RAD
AIRSBF	ANAL	Naming convention for AIRSBF data file
ALIST	GENERAL	Extra set of files to be added to rlist if ARCHIVE=YES; used only if rlist is being generated on the fly in this step; done in reconcile.sh
AM_EXEC	FCST	Atmospheric model executable
AM_FCS	FCST	See $FCSTEXECTMP
AMSREBF	ANAL	AMSR/E bufr radiance dataset
ANALSH	ANAL	Analysis job script, usually "anal.sh"
ANALYSISSH	ANAL	Analysis driver script
ANAVINFO	ANAL	Text files containing information about the state, control, and meteorological variables used in the GSI analysis
ANGUPDATESH	ANGU	Angle update script
ANGUPDATEXEC	ANGU	Angle update executable
anltype	ANAL	Analysis type (gfs or gdas) for verification (default=gfs)
Apercent	FCST	For idvc=3, 100: sigma-p, 0: pure-theta
append_rlist	GENERAL	Location of append_rlist (comment out if not using)
AQCX	PREP	Prep step executable
ARCA00GDAS	ARCH	Points to HPSS file name for ARCA files for 00Z cycle GDAS

ARCA00GFS	ARCH	Points to HPSS file name for ARCA files for 00Z cycle GFS
ARCA06GDAS	ARCH	Points to HPSS file name for ARCA files for 06Z cycle GDAS
ARCA06GFS	ARCH	Points to HPSS file name for ARCA files for 06Z cycle GFS
ARCA12GDAS	ARCH	Points to HPSS file name for ARCA files for 12Z cycle GDAS
ARCA12GFS	ARCH	Points to HPSS file name for ARCA files for 12Z cycle GFS
ARCA18GDAS	ARCH	Points to HPSS file name for ARCA files for 18Z cycle GDAS
ARCA18GFS	ARCH	Points to HPSS file name for ARCA files for 18Z cycle GFS
ARCB00GFS	ARCH	Points to HPSS file name for ARCB files for 00Z cycle GFS
ARCB06GFS	ARCH	Points to HPSS file name for ARCB files for 06Z cycle GFS
ARCB12GFS	ARCH	Points to HPSS file name for ARCB files for 12Z cycle GFS
ARCB18GFS	ARCH	Points to HPSS file name for ARCB files for 18Z cycle GFS
ARCC00GFS	ARCH	Points to HPSS file name for ARCC files for 00Z cycle GFS
ARCC06GFS	ARCH	Points to HPSS file name for ARCC files for 06Z cycle GFS
ARCC12GFS	ARCH	Points to HPSS file name for ARCC files for 12Z cycle GFS
ARCC18GFS	ARCH	Points to HPSS file name for ARCC files for 18Z cycle GFS
ARCDIR	ARCH	Location of online archive
ARCDIR1	ARCH	Online archive directory
ARCH_TO_HPSS	ARCH	Make hpss archive
ARCHCFSRRSH	ARCH	Script location
ARCHCOPY	ARCH	If yes then copy select files (ARCR and ARCO in rlist) to online archive

ARCHDAY	ARCH	Days to delay online archive step
ARCHIVE	ARCH	Make online archive
ARCHSCP	ARCH	If yes & user glopara, scp all files for this cycle to alternate machine
ARCHSCPTO	ARCH	Remote system to receive scp'd data (mist->dew, dew->mist)
ARCHSH	ARCH	Archive script
ASYM_GODAS	ANAL	For asymmetric godas (default=NO)
ATARDIR	ARCH	HPSS tape archive directory
ATARFILE	ARCH	HPSS tape archive tarball file name, $ATARDIR/\$ADAY.tar
AVG_FCST	FCST	Time average forecast output files
AVRG_ALL	AVRG	To submit averaging and archiving scripts; this should be set to 'YES' - valid for reanalysis
AVRGALLSH	AVRG	Script location
B1AMUA	ANAL	Location and naming convention of B1AMUA data file
B1HRS4	ANAL	Location and naming convention of B1HRS4 data file
B1MHS	ANAL	Location and naming convention of B1MHS data file
BERROR	ANAL	Location and naming convention of BERROR files
BUFRLIST	PREP	BUFR data types to use
C_EXEC	FCST	Coupler executable
CAT_FLX_TO_PGB	POST	Cat flx file to pgb files (only works for ncep post and IDRT=0)
ccnorm	FCST	Assumes all cloud water is inside cloud (true), operation (false)
CCPOST	POST	To run concurrent post
ccwf	FCST	Cloud water function, ras, 1: high res, 2: T62
CDATE	GENERAL	Date of run cycle (YYYMMDDCC), where CC is the forecast cycle, e.g. 00, 06, 12, 18
CDATE_SKIP	ANAL	LDAS modified sfc files not used before this date; must be >24 hours from the start
CDFNL	VRFY	SCORES verification against selected dump, pgbanl.gdas or pgbanl.gfs

CDUMP	GENERAL	Dump name (gfs or gdas)
CDUMPFCST	PREP	Fits-to-obs against gdas or gfs prep
CDUMPPREP	PREP	Prep dump to be used in prepqfit
CFSRDMP	DUMP	Location of CFS/climate dump archive
CFSRR_ARCH	ARCH	Script location
CFSRRPLOTSH	AVRG	Script location
CFSV2	FCST	CFS switch, YES=run CFS version 2
ch1	FCST & POST	Hours in gdas fcst1 & post1 job wall-clock-limit [hours:minutes:seconds] (see reconcile script)
ch2	FCST & POST	Same as ch1 but for segment 2
cha	ANAL	Analysis wall time; hours in job wall-clock-limit [hours:minutes:seconds] (see reconcile script)
CHG_LDAS	ANAL	To bring in new vegtyp table to LDAS
CHGRESEXEC	GENERAL	Chgres executable location
CHGRESSH	GENERAL	Chgres script location
CHGRESTHREAD	GENERAL	Number of threads for chgres (change resolution)
CHGRESVARS	GENERAL	Chgres variables
CLDASSH	ANAL	CLDAS script
climate	FCST	CFS variable, grib issue
CLIMO_FIELDS_OPT	FCST	Interpolate veg type, soil type, and slope type from inputgrid, all others from sfcsub.f, 3: to coldstart higher resolution run
cm1	FCST & POST	Minutes in gdas fcst1 & post1 job wall-clock-limit [hours:minutes:seconds] (see reconcile script)
cm2	FCST & POST	Same as cm1 but for segment 2
cma	ANAL	Analysis wall time; minutes in job wall-clock-limit [hours:minutes:seconds] (see reconcile script)
cmapdl	GENERAL	Cmap dump location in $COMDMP
cmbDysPrf4	ANAL	GODAS executable
cmbDysPrfs4	ANAL	GODAS executable
CO2_seasonal_cycle	FCST	CO2 seasonal cycle; global_co2monthlycyc1976_YYYY.txt

CO2DIR	FCST	Directory with CO2 files
COMCOP	GENERAL	Location where copy.sh looks for production (or alternate) files
COMDAY	GENERAL	Directory to store experiment "dayfile" output (dayfile contains stdout & stderr), see $COMROT
COMDIR	GENERAL	See $TOPDIR
COMDMP	GENERAL	Location of key production (or alternate) files (observation data files, surface boundary files)
COMDMPTMP	GENERAL	Temporary version of $COMDMP
COMROT	GENERAL	Experiment rotating/working directory, for large data and output files
COMROTTMP	GENERAL	If set, replaces config value of $COMROT (protects COMROT, or to define COMROT with variables evaluated at runtime)
CONFIG	GENERAL	Configuration file name
CONVINFO	ANAL	Location of convinfo.txt file, conventional data
COPYGB	GENERAL	Location of copygb utility
COUP_FCST	FCST	NO: AM model only, YES: coupled A-O forecast (default=NO)
COUP_GDAS	FCST	YES: run coupled GDAS
COUP_GFS	FCST	YES: run coupled GFS forecast
CQCX	PREP	Prep executable
crtrh	FCST	For Zhao microphysics, if zhao_mic is .false., then for Ferrier-Moorthi microphysics
cs1	FCST & POST	Seconds in gdas fcst1 & post1 job wall-clock-limit [hours:minutes:seconds] (see reconcile script)
cs2	FCST & POST	Same as cs1 but for segment 2
csa	ANAL	Analysis wall time; seconds in job wall-clock-limit [hours:minutes:seconds] (see reconcile script)
CSTEP	GENERAL	Step name (e.g. prep, anal, fcst2, post1, etc.)
ctei_rm	FCST	Cloud top entrainment instability criterion, mstrat=true
CTL_ANL	POST	Parameter file for grib output
CTL_FCS	POST	Parameter file for grib output

CTL_FCS_D3D	POST	Parameter file for grib output
CUE2RUN	COMP	User queue variable; LoadLeveler class for parallel jobs (i.e. dev)
CUE2RUN1	COMP	Similar to $CUE2RUN but alternate queue
CUE2RUN3	COMP	Similar to $CUE2RUN but alternate queue
cWGsh	ANAL	GODAS script
CYCLESH	GENERAL	Script location
CYCLEXEC	GENERAL	Executable location
CYINC	GENERAL	Variable used to decrement GDATE {06}
DATATMP	GENERAL	Working directory for current job
DAYDIR	GENERAL	See $COMROT
DELTIM	FCST	Time step (seconds) for segment 1
DELTIM2	FCST	Time step (seconds) for segment 2
DELTIM3	FCST	Time step (seconds) for segment 3
diagtable	PREP	Ocean and ice diagnostic file
diagtable_1dy	PREP	Oceanand ice diagnostic file
diagtable_1hr	PREP	Ocean and ice diagnostic file
diagtable_3hr	PREP	Ocean and ice diagnostic file
diagtable_6hr	PREP	Ocean and ice diagnostic file
diagtable_hrs	PREP	Ocean and ice diagnostic file
diagtable_long	PREP	Ocean and ice diagnostic file
dlqf	FCST	Fraction of cloud water removed as parcel ascends
DMPDIR	DUMP	Dump directory location
DMPEXP	DUMP	Dump directory location, gdasy/gfsy
DMPOPR	DUMP	Dump directory location
DO_RELOCATE	PREP	Switch; to perform relocation or not
DO2ANL	ANAL	Do second analysis run, depends on value of CDFNL
DODUMP	DUMP	For running in real-time, whether or not to run the dump step
DSDUMP	DUMP	CFS dump directory

dt_aocpl	FCST	Coupler timestep
dt_cpld	FCST	Coupled timestep
dt_ocean	FCST	Ocean timestep
dt_rstrt	FCST	OM restart writing interval/timestep (small)
dt_rstrt_long	FCST	OM restart writing interval/timestep (long)
Dumpsh	DUMP	Dump script location and name
EDATE	GENERAL	Analysis/forecast cycle end date - must be >CDATE; analysis/forecast cycle ending date (YYYYMMDDCC, where CC is the cycle)
EDUMP	GENERAL	Cycle ending dump (gdas or gfs)
EMISDIR	FCST	Directory, usually set to $FIX_RAD, see $FIX_RAD
ENTHALPY	FCST	Control the chgres and nceppost (default=NO)
ESTEP	GENERAL	Cycle ending step; stop experiment when this step is reached for $EDATE; ***this step is not run***
EXEC_AMD	FCST	Atmospheric model directory
EXEC_CD	FCST	Coupler directory
EXEC_OMD	FCST	Ocean model directory
EXECcfs	FCST	CFS executable directory location
EXECDIR	GENERAL	Executable directory (typically underneath HOMEDIR)
execdir_godasprep	PREP	GODAS prep executable directory, see $EXECDIR
EXECICE	FCST	Sea ice executable directory, see $EXECDIR
EXPDIR	GENERAL	Experiment directory under /save, where your configuration file, rlist, runlog, and other experiment scripts reside
FAISS	FCST	Scale in days to relax to sea ice to climatology
fbak2	FCST	Back up time for 2nd segment
fbak3	FCST	Back up time for 3rd segment
FCSTEXECDIR	FCST	Location of forecast executable directory (usually set to $EXECDIR)
FCSTEXECTMP	FCST	Location and name of forecast executable
FCSTSH	FCST	Forecast script name and location
FCSTVARS	FCST	Group of select forecast variables and their values

fcyc	FCST	Surface cycle calling interval
fdfi_1	FCST	Digital filter time for AM 1st segment (default=3)
fdfi_2	FCST	Run digital filter for 2nd segment (default=0)
fdump	VRFY	Verifying forecasts from gfs: GFS analysis or gdas: GDAS analysis
FH_END_POST	POST	Implying use FHMAX (defaul=99999)
FH_STRT_POST	POST	Implying to use FHINI or from file $COMROT/FHREST.$CDUMP.$CDATE.$nknd (default=99999)
FHCYC	FCST	Cycling frequency in hours
FHDFI	FCST	Initialization window in hours (if =0, no digital filter; if =3, window is +/- 3hrs)
FHGOC3D	FCST	Hour up to which data is needed to force offline GOCART to write out data
FHINI	FCST	Initial forecast hour
FHLWR	FCST	LW radiation calling interval (hrs); longwave frequency in hours
FHMAX	FCST	Maximum forecast hour
FHMAX_HF	FCST	High-frequency output maximum hours; for hurricane track, gfs fcst only for 126-hr is needed
FHOUT	FCST	Output frequency in hours
FHOUT_HF	FCST	High frequency output interval in hours; for hurricane track, gfs fcst only for 126-hr is needed
FHRES	FCST	Restart frequency in hours
FHROT	FCST	Forecast hour to Read One Time level
FHSTRT	FCST	To restart a forecast from a selected hour, default=9999999
FHSWR	FCST	SW radiation calling interval (hrs); frequency of solar radiation and convective cloud (hours)
FHZER	FCST	Zeroing frequency in hours
FIT_DIR	VRFY	Directory for SAVEFITS output
FIX_LIS	PREP	Location of land model fix files
FIX_OCN	PREP	Location of ocean model fix files

FIX_OM	PREP	See $FIX_OCN
FIX_RAD	PREP	Fix directory, usually set to $FIXGLOBAL
FIXDIR	PREP	Fix file directory
FIXGLOBAL	PREP	Atmospheric model fix file directory
flgmin	FCST	Minimum large ice fraction
fmax1	FCST	Maximum forecast hour in 1st segment (default=192 hrs)
fmax2	FCST	Maximum forecast hour in 2nd segment (default=384 hrs)
fmax3	FCST	Maximum forecast hour in 3rd segment (default=540 hrs)
FNAISC	FCST	CFS monthly ice data file
FNMASK	FCST	Global slmask data file, also see $SLMASK
FNOROG	FCST	Global orography data file
FNTSFC	FCST	CFS oi2sst data file
FNVEGC	FCST	CFS vegfrac data file
FNVETC	FCST	Global vegetable type grib file
FORECASTSH	FCST	Forecast script name and location
fout_a	FCST	GDAS forecast output frequency (default=3); used when gdas_fh is not defined (i.e. no long gdas fcst)
fout1	FCST	GFS sig, sfc, flx output frequency for 1st segment (default=3 hr)
fout2	FCST	GFS sig, sfc, flx output frequency for 2nd segment (default=3 hr)
fout3	FCST	GFS sig, sfc, flx output frequency for 3rd segment (default=3 hr)
foutpgb1	POST	NCEPPOST pgb frequency for 1st segment (default=fout1)
foutpgb2	POST	NCEPPOST pgb frequency for 2nd segment (default=fout1)
foutpgb3	POST	NCEPPOST pgb frequency for 3rd segment (default=fout1)
fres1	FCST	Interval for restart write, 1st segment (default=24 hr)

fres2	FCST	Interval for restart write, 2nd segment (default=24 hr)
fres3	FCST	Interval to write restart for 3rd segment (default=fres2)
fseg	FCST	Number of AM forecast segments; maximum=3 (default=1)
FSNOL	FCST	Scale in days to relax to snow to climatology
FTSFS	FCST	Scale in days to relax to SST anomaly to zero
fzer1	FCST	GFS output zeroing interval for 1st segment (default=6 hr)
fzer2	FCST	GFS output zeroing interval for 2nd segment (default=6 hr)
fzer3	FCST	GFS output zeroing interval for 3rd segment (default=6 hr)
G3DPSH	ANAL	G3DP script name and location
gdas_cyc	FCST	Number of GDAS cycles
gdas_fh	FCST	Default=999, i.e. no long fcst in GDAS step when <999, that would be the interval at which seasonal or longer from gdas initial conditions are made; for example, if gdas_fh=6 runs are made
GDAS_GP	POST	YES: use old post (global_postgp.sh), NO: nceppost
GDUMP	GENERAL	Dump to use for guess files (defaults to $CDFNL, which defaults to "gdas")
GENPSICHI	POST	Generate psi (streamfunction) and chi (velocity potential)
GENPSICHIEXE	POST	Executable for GENPSICHI
gfs_cyc	FCST	GFS cycles (00, 06, 12, and 18Z) (default=1 - (00Z) cycle)
GFSDUMP	DUMP	GFS dump subdirectory name and location, usually "$DMPDIR/dump"
gg_tracers	FCST	Semilag option
GLDASCYCHR	FCST	GLDAS cycling frequency
GODAS_DATA_DELAY	ANAL	Delay for ocean data in days
GODAS_WNDO	ANAL	Data window for asymmetric godas
GODASEXEC	ANAL	GODAS executable
GODASSH	ANAL	GODAS script

GRID_IDD	FCST	3D output options
GRID11FCST00gdas	FCST	Grib identifier for 00z GDAS forecast output
GRID11FCST06gdas	FCST	Grib identifier for 06z GDAS forecast output
GRID11FCST12gdas	FCST	Grib identifier for 12z GDAS forecast output
GRID11FCST18gdas	FCST	Grib identifier for 18z GDAS forecast output
grid25_1	POST	Define this to interpolate pgb file to 2.5 x 2.5
grid25_2	POST	Same as grid25_1 but for segment 2 of post
grid62_1	POST	Define this to interpolate fix file to T62 grid
GROUP	GENERAL	LoadLeveler group (i.e. g01)
group_name	GENERAL	Similar to $GROUP
GSIDIR	ANAL	GSI HOMEDIR, usually equals $HOMEDIR
GSIEXEC	ANAL	GSI executable name and location
GSIFIXDIR	ANAL	Location of GSI fix files
HOMEcfs	FCST	CFS HOMEDIR, usually equals $HOMEDIR
HOMEDIR	GENERAL	Home directory for parallel scripts
HORZ_DIR	VRFY	Directory for SAVEFITS output
HPSSTAR	ARCH	Location of hpsstar utility (creates, retrieves, and manages tarfiles on HPSS)
HRKDAY	GENERAL	Hours to keep dayfiles in COMROT
HRKOCN_ANL	GENERAL	Hours to keep ocean analysis file
HRKOCN_GRB	GENERAL	Hours to keep ocean grib output file
HRKRES	GENERAL	Hours to keep restart files
HRKROT	GENERAL	Hours to keep rotating archive
HRKSIG	GENERAL	Hours to keep sigma and sfc fcst files in directory $COMROT
HRKSIGG	GENERAL	Hours to keep sigma files from analysis in directory COMROT
HRKTMP	GENERAL	Hours to keep tmpdir
HRKVFY	GENERAL	Hours to keep verification files in directory COMROT
HYBRID	FCST	Switch to run hybrid

IAER	FCST	111: with stratospheric aerosol, tropospheric aerosol LW, tropospheric aerosol SW
ialb	FCST	For original albedo, 0: climatology SW albedo based on surface vegetation types, 1: MODIS based land surface albedo
ICO2	FCST	0: fixed CO2 constant, 1: time varying global mean CO2, 2: changing CO2
ictm	FCST	CO2 option for radiation, YYYY#
IDRT_NP	POST	Master pgb from global_nceppost.sh, 4: gaussian, 0: linear
IDSL	FCST	Integer new type of sigma structure, 1: Phillips approach, 2: Henry, plain average
idvc_a	FCST	AM vertical coordinate for analysis, 2: sigma-p (Sela), 3: generalized (Juang)
idvc_f	FCST	For hybrid model forecast (2: Joe Sela, 3: Henry Juang)
IDVM	FCST	Integer new vertical mass variable ID
idvt	FCST	Integer new tracer variable ID; first number: # of cloud species, second number: location of ozone in tracer
IEMS	FCST	0: blackbody ground emission, 1: climatology on one-deg map
IGEN	FCST	Integer output generating code (See ON388 Table A), grib output identifier, GFS=82, CFS=197
IGEN_ANL	FCST	Same as IGEN but for analysis
IGEN_FCST	FCST	Same as IGEN but for forecast
IGEN_OCNP	FCST	Same as IGEN but for ocean analysis
inch_1	FCST	Interval of coupled run (default=360)
inch_2	FCST	Coupled model interval of increment hour look (segment 2)
io_1	FCST	Forecast pgb output lon resolution, 1st segment
io_2	FCST	Forecast pgb output lon resolution, 2nd segment
io_3	FCST	Forecast pgb output lon resolution, 3rd segment
io_a	ANAL	Analysis pgb output lon and lat resolution
io_save	ARCH	Longitude dimension for online archive pgb files (defaults to 144... only applies if lower res than posted

		pgb files)
IOVR_LW	FCST	0: random cloud overlap for LW, 1: maximum/random cloud overlap for LW
IOVR_SW	FCST	0: random cloud overlap for SW, 1: maximum/random cloud overlap for SW
ISOL	FCST	0: fixed solar constant, 1: changing solar constant
ISUBC_LW	FCST	0: standard LW clouds (no MCICA), 1: prescribed MCICA seeds, 2: random MCICA seeds
ISUBC_SW	FCST	0: standard SW clouds (no MCICA), 1: prescribed MCICA seeds, 2: random MCICA seeds
IVS	FCST	Sigma file format (options 198410, 200509 defined in /nwprod/sorc/global_fcst.fd/sigio_module.f)
ivssfc	FCST	Surface file version
ivssig	FCST	Sigma file version
JCAP	FCST	Wave number (0-192 hr), atmospheric model resolution (spectral truncation), eg. JCAP=382
JCAP_A	FCST	See $JCAP
JCAP_TMP	FCST	See $JCAP
JCAP2	FCST	Wave number (192-384 hr) for 2nd segment, see $JCAP
JCAP3	FCST	Wave number (384-540 hr) for 3rd segment, see $JCAP
jo_1	FCST	Forecast pgb output lat resolution, 1st segment
jo_2	FCST	Forecast pgb output lat resolution, 2nd segment
jo_3	FCST	Forecast pgb output lat resolution, 3rd segment
jo_a	FCST	Analysis pgb output lon and lat resolution
jo_save	FCST	Lat dimension for online archive pgb files (defaults to 72... only applies if lower res than posted pgb files
JOBSDIR	GENERAL	Job script directory (typically underneath HOMEDIR)
JUST_AVG	AVRG	Default=NO
JUST_POST	POST	Terminate jobs after finishing post
JUST_TSER	POST	Extract just time-series by running post
km_mom4	POST	Number of MOM4 levels
ko_1	FCST	Forecast pgb output lev resolution, 1st segment

ko_2	FCST	Forecast pgb output lev resolution, 2nd segment
ko_3	FCST	Forecast pgb output lev resolution, 3rd segment
ko_a	ANAL	Analysis pgb output lev resolution
kto_1	FCST	Forecast IPV (isentropic potential vorticity) output resolution, if kto is set to 0, then no IPV output
kto_2	FCST	Vertical levels for segment 2, post step
kto_3	FCST	Same as kto_2 but for segment 3
LANLSH	ANAL	Land analysis script name and location
LATA	ANAL	Grid used by hurricane relocation, analysis grid lat dimension (typically linear gaussian grid)
LATB	FCST	Model grid lat dimension (aka quadratic grid)
LATB_D3D	FCST	3D diagnostic output grid parameter
LATB2	FCST	Same as $LATB but for segment 2
LATB3	FCST	Same as $LATB but for segment 3
LATCH	FCST	Integer number of latitudes to process at one time in global_chgres; defaults to 8 in the code; defaults to 48 in branch parallel scripts; set to 8 in configuration file if you must match production when moving from the 1st to 2nd fcst segment; otherwise, go with the branch parallel script default of 48 to save resources (check current version of global_chgres.fd/chgres.f to confirm the code default; check fcst.sh and reconcile for script default)
ld3d_1	FCST	Write out 3D diagnostics, .false.: no 3D diagnostics
ld3d_2	FCST	3D diagnostic for segment 2
ld3d_3	FCST	3D diagnostic for segment 3
ldas_cyc	ANAL	0: no ldas cycles (default=0)
LDIAG3D	FCST	Switch for 3D diagnostics (default=false)
LEVS	FCST	Number of atmospheric model vertical levels
lg3d_1	FCST	GOCART option segment 1 (default=false)
lg3d_2	FCST	GOCART option segment 2 (default=false)
lingg_a	FCST	Semilag option
lingg_b	FCST	Semilag option

LINKFILESH	GENERAL	Link file script
liope	FCST	Atmospheric variable for io pes (default=.true.)
LISEXEC	ANAL	GLDAS (aka LIS) executable
LISSH	ANAL	GLDAS (aka LIS) script
LONA	FCST	Grid used by hurricane relocation, analysis grid lon dimension (typically linear gaussian grid)
LONB	FCST	Model grid lon dimension (aka quadratic grid)
LONB_D3D	FCST	3D diagnostic output grid parameter
LONB2	FCST	Same as $LONB but for segment 2
LONB3	FCST	Same as $LONB but for segment 3
LONSPERLAT	FCST	Forecast step, global_lonsperlat text file
lsm	FCST	Land surface model, 1: NOAH land model, 0: OSU land model
LSOIL	FCST	Number of soil layers
MAKEPREPBUFRSH	PREP	Makeprepbufr script, created prepbufr
mdlist	VRFY	Exps (up to 10) to compare in maps
MEANDIR	AVRG	Directory for monthly means
MFCST00GFS	GENERAL	Starting number for dayfile iterations
mkEvNc4r	ANAL	GODAS executable
MODIS_ALB	FCST	To use MODIS based albedo product
MON_AVG	AVRG	CFS option, monthly averages for long integrations, starts 00z first day of month
MP_PULSE	COMP	IBM computing resource variable
mppnccombine	FCST	Location and name of cfs_mppnccombine executable
mstrat	FCST	Switch to turn on/off Moorthi stratus scheme
MTNDIR	FCST	See $FIXGLOBAL
MTNVAR	FCST	The global_mtnvar fortran code
NARRSNO	ANAL	How snow assimilation is performed, North American Reanalysis
NCEPPOST	POST	Switch to use NCEP post (default=YES)
NCP	GENERAL	Location of ncp utility

ncw	FCST	For Ferrier microphysics
NEW_DAYFILE	GENERAL	To create new dayfile for every rerun
newoz_nrl	FCST	YES: use NRL ozone production and loss coefficients (default=YES)
NGPTC	FCST	For operational GFS, not reproducible with different NGPTC; number of horizontal points computed in the same call inside radiation and physics (defaults to JCAP/10)
nknd_fcst	FCST	For hindcasts from segment 2 only
NLAT_A	ANAL	Analysis grid parameter, JCAP > 574
NLON_A	ANAL	Analysis grid parameter, JCAP > 574
NOANAL	ANAL	NO: run analysis and forecast, YES: no analysis (default=NO)
NOFCST	FCST	NO: run analysis and forecast, YES: no forecast (default=NO)
npe_node_a	ANAL	Number of PEs/node for atmospheric analysis with GSI
npe_node_ang	ANGU	Number of PEs/node for global_angupdate
npe_node_av	AVRG	Number of PEs/node for avrg
npe_node_f	FCST	Number of PEs/node for AM forecast
npe_node_o	ANAL	Number of PEs/node for ocean analysis
npe_node_po	POST	Number of PEs/node for post step (default=16)
npe_node_pr	PREP	Number of PEs/node for prep step (default=32 for dew/mist/haze)
nproco_1	FCST	Number of processors for ocean model 1st segment
nproco_2	FCST	Number of processors for ocean model 2nd segment
nproco_3	FCST	Number of processors for ocean model 3rd segment
NRLACQC	PREP	NRL aircraft QC, if="YES" will quality control all aircraft data
nsout	FCST	Outputs every AM time step when =1 (default=0)
NSST_ACTIVE	FCST	NST_FCST, 0: AM only, no NST model, 1: uncoupled, non-interacting, 2: coupled, interacting
nth_f1	FCST	Threads for AM 1st segment
nth_f2	FCST	Threads for AM 2nd segment

nth_f3	FCST	Threads for AM 3rd segment
NTHREADS_GSI	ANAL	Number of threads for anal
NTHSTACK	FCST	Stacks for fcst step (default=128000000)
NTHSTACK_GSI	ANAL	Stack size for anal (default=128000000)
NUMPROCANAL	ANAL	Number of tasks for GDAS anal
NUMPROCANALGDAS	ANAL	Number of tasks for GDAS anal
NUMPROCANALGFS	ANAL	Number of tasks for GFS anal
NUMPROCAVRGGDAS	ANAL	Number of PEs for GDAS average
NUMPROCAVRGGFS	ANAL	Number of PEs for GFS average
NWPROD	GENERAL	Option to point executable to nwprod versions
O3CLIM	FCST	Location and name of global_o3clim text file
O3FORC	FCST	Location and name of global_o3prdlos fortran code
OANLSH	ANAL	Ocean analysis script
OCN2GRIBEXEC	POST	Ocean to grib executable
OCNMEANDIR	AVRG	Directory for ocn monthly means
ocnp_delay_1	POST	OM post delay time
ocnp_delay_2	POST	OM post delay time
OCNPSH	POST	Ocean post script
OIQCT	PREP	Prep step prepobs_oiqc.oberrs file
oisst_clim	ANAL	Ocean analysis fix field
OM_EXEC	FCST	Ocean model executable
omres_1	FCST	Ocean 1st segment model resolution (0.5 x 0.25) and number of processors
omres_2	FCST	Ocean 2nd segment model resolution (0.5 x 0.25) and number of processors
omres_3	FCST	Ocean 3rd segment model resolution (0.5 x 0.25) and number of processors
OPANAL_06	ANAL	For old ICs without LANDICE, only applicable for starting from existing analysis
OPREPSH	PREP	Ocean analysis prep script
OROGRAPHY	FCST	Global orography grib file

OUT_VIRTTEMP	FCST	Output into virtual temperature (true)
OUTTYP_GP	POST	1: gfsio, 2: sigio, 0: both
OUTTYP_NP	POST	1: gfsio, 2: sigio, 0: both
OVERPARMEXEC	POST	CFS overparm grib executable
OZINFO	ANAL	Ozone info file
PARATRKR	TRAK	Script location
PARM_GODAS	PREP	GODAS parm file
PARM_OM	PREP	Ocean model parm files
PARM_PREP	PREP	Prep step parm files
PCONFIGS	GENERAL	For running in real-time, configuration file
PCPINFO	ANAL	PCP info files
PEND	GENERAL	Location of pend script
pfac	FCST	Forecasting computing variable
pgb_typ4prep	PREP	Type of pgb file for prep step (default=pgbf)
pgbf_gdas	POST	GDAS pgbf file resolution, 4: 0.5 x 0.5 degree, 3: 1 x 1 degree
PMKR	GENERAL	Needed for parallel scripts
polist_37	POST	Output pgb (pressure grib) file levels
polist_47	POST	Output pgb (pressure grib) file levels
post_delay_1	POST	AM post delay time
post_delay_2	POST	AM post delay time
POST_SHARED	POST	Share nodes (default=YES)
POSTGPEXEC_GP	POST	Post executable, for enthalpy version
POSTGPEXEC_NP	POST	Post executable, ncep post
POSTGPSH_GP	POST	$POSTGPEXEC_GP script
POSTGPSH_NP	POST	$POSTGPEXEC_NP script
POSTGPVARSNP	POST	Similar to FCSTVARS but for post variables
POSTSH	POST	Post script
POSTSPL	POST	Special CFSRR analysis file created for CPC diagnostics

PRECIP_DATA_DELAY	ANAL	Delay for precip data in hours (for global lanl)
PREPDIR	PREP	Location of prep files/codes/scripts, usually $HOMEDIR
PREPFIXDIR	PREP	Location of prep fix files
PREPQFITSH	PREP	Name and location of a prep script
PREPSH	PREP	Name and location of main prep script
PREX	PREP	Prevents executable
PROCESS_TROPCY	PREP	Switch, if YES: run QCTROPCYSH script (default ush/syndat_qctropcy.sh)
PRPC	PREP	Prep parm file
PRPT	PREP	Prep bufr table
PRPX	PREP	Prepdata executable
PRVT	PREP	Global error table for prep
PSLOT	GENERAL	Experiment ID
PSTX	PREP	Prep step, global_postevents executable
PSUB	GENERAL	Location of psub script
q2run_1	FCST	Additional queue for fcst segment 1
q2run_2	FCST	Additional queue for fcst segment 2
QCAX	PREP	Prep step, prepobs_acarsqc executable
r2ts_clim	ANAL	Ocean analysis fix field
ras	FCST	Convection parameter, relaxed
readfi_exec	FCST	CFS sea ice executable
readsst_exec	FCST	CFS sea ice executable
RECONCILE	GENERAL	Location of reconcile script
REDO_POST	POST	Default=NO
regrid_exec	FCST	CFS sea ice executable
RELOCATESH	PREP	Name and location of relocation script
RELOX	PREP	Name and location of relocation executable
RESDIR	GENERAL	Restart directory
RESUBMIT	GENERAL	To resubmit a failed job (default=NO)

RLIST	GENERAL	List that controls input and output of files for each step
RM_G3DOUT	FCST	For GOCART related special output
RM_ORIG_G3D	FCST	For GOCART related special output
ROTDIR	GENERAL	See $COMROT
RTMAERO	ANAL	Location of CRTM aerosol coefficient bin file
RTMCLDS	ANAL	Location of CRTM cloud coefficient bin file
RTMEMIS	ANAL	Location of CRTM emissivity coefficient bin file
RTMFIX	ANAL	Location of CRTM fix file(s)
RUN_ENTHALPY	FCST	Control the forecast model (default=NO)
RUN_OPREP	PREP	YES: run ocean prep to get tmp.prf and sal.prf
RUN_PLOT_SCRIPT	AVRG	Script location
RUN_RTDUMP	ANAL	YES: archived tmp.prf and sal.prf used
rundir	GENERAL	Verification run directory
RUNLOG	GENERAL	The experiment runlog
SALTSFCRESTORE	ANAL	GODAS script
SATANGL	ANAL	Name and location of satangbias file
SATINFO	ANAL	Name and location of satinfo file
SAVEFITS	VRFY	Fit to obs scores
SBUVBF	ANAL	Location and naming convention of osbuv8 data file
SCRDIR	GENERAL	Scripts directory (typically underneath $HOMEDIR)
scrubtyp	GENERAL	Scrub or noscrub
semilag	FCST	Semilag option
SEND2WEB	VRFY	Whether or not to send maps to webhost
SET_FIX_FLDS	COPY	Only useful wit copy.sh; create orographic and MODIS albedo related fix fields if they don't exist
SETUP	ANAL	GSI setup namelist
SHDIR	GENERAL	Similar to SCRDIR, just a directory setting
sice_rstrt_exec	FCST	Sea ice executable
SICEUPDATESH	FCST	Sea ice update script
SLMASK	FCST	Global slmask data file, also see $FNMASK

snoid	ANAL	Snow id (default=snod)
SNOWNC	ANAL	NetCDF snow file
SSMITBF	ANAL	SSM/I bufr radiace dataset
sst_ice_clim	ANAL	Fix fields for ocean analysis
SSTICECLIM	ANAL	Ocean analysis fix field
SUB	GENERAL	Location of sub script
SYNDATA	PREP	Switch (default=YES)
SYNDX	PREP	Syndat file, prep step
tasks	FCST	Number of tasks for 1st segment of forecast
tasks2	FCST	Number of tasks for 2nd segment of forecast
tasks3	FCST	Number of tasks for 3rd segment of forecast
tasksp_1	POST	Number of PEs for 1st segment of post
tasksp_2	POST	Number of PEs for 2nd segment of post
tasksp_3	POST	Number of PEs for 3rd segment of post
thlist_16	POST	Output theta levels
TIMEAVGEXEC	AVRG	Executable location
TIMEDIR	GENERAL	Directory for time series of selected variables
TIMELIMANAL	ANAL	Wall clock time for AM analysis
TIMELIMAVRG	AVRG	CPU limit (hhmmss) for averaging
TIMELIMPOST00GDAS	POST	CPU limit for 00z GDAS post
TIMELIMPOST00GFS	POST	CPU limit for 00z GFS post
TIMELIMPOST06GFS	POST	CPU limit for 06z GFS post
TIMELIMPOST12GFS	POST	CPU limit for 12z GFS post
TIMELIMPOST18GFS	POST	CPU limit for 18z GFS post
TIMEMEANEXEC	AVRG	Executable location
TOPDIR	GENERAL	Top directory, defaults to '/global' on CCS or '/mtb' on Vapor if not defined
TOPDRA	GENERAL	Top directory, defaults to '/global' on CCS or '/mtb' on Vapor if not defined
TOPDRC	GENERAL	Top directory, defaults to '/global' on CCS or '/mtb' on

		Vapor if not defined
TOPDRG	GENERAL	Top directory, defaults to '/global' on CCS or '/mtb' on Vapor if not defined
TRACKERSH	TRAK	Tracker script location
TSER_FCST	FCST	Extract time-series of selected output variables
USE_RESTART	GENERAL	Use restart file under COMROT/RESTART if run is interrupted
USHAQC	PREP	See $USHDIR
USHCQC	PREP	See $USHDIR
USHDIR	GENERAL	Ush directory (typically underneath HOMEDIR)
USHGETGES	PREP	Directory location of getges.sh script
USHICE	PREP	See $USHDIR
USHNQC	PREP	See $USHDIR
USHOIQC	PREP	See $USHDIR
USHPQC	PREP	See $USHDIR
USHPREV	PREP	See $USHDIR
USHQCA	PREP	See $USHDIR
USHSYND	PREP	Directory, usually "$PREPDIR/ush"
USHVQC	PREP	See $USHDIR
usrdir	GENERAL	See $LOGNAME
VBACKUP_PRCP	VRFY	Hours to delay precip verification
VDUMP	VRFY	Verifying dump
vlength	VRFY	Verification length in hours (default=384)
VRFY_ALL_SEG	VRFY	NO: submit vrfy only once at the end of all segments, YES: submit for all segments (default=YES)
vrfy_delay_1	VRFY	AM verification delay time (in hhmm) for segment 1
vrfy_delay_2	VRFY	AM verification delay time for segment 2
VRFYPRCP	VRFY	Precip threat scores
VRFYSCOR	VRFY	Anomaly correlations, etc.
VRFYTRAK	VRFY & TRAK	Hurricane tracks

VSDB_START_DATE	VRFY	Starting date for vsdb maps
VSDB_STEP1	VRFY	Compute stats in vsdb format (default=NO)
VSDB_STEP2	VRFY	Make vsdb-based maps (default=NO)
vsdbhome	VRFY	Script home (default=$HOMEDIR/vsdb)
vsdbsave	VRFY	Place to save vsdb database
VSDBSH	VRFY	Default=$vsdbhome/vsdbjob.sh
WEBDIR	VRFY	Directory on web server (rzdm) for verification output
webhost	VRFY	Webhost (rzdm) computer
webhostid	VRFY	Webhost (rzdm) user name
yzdir	VRFY	Additional verification directory, based on personal directory of Yuejian Zhu
zflxtvd	FCST	Vertical advection scheme
zhao_mic	FCST	TRUE: Zhao microphysics option, FALSE: Ferrier microphysics

Appendix C

Finding GDAS and GFS production run files

Select files needed to run parallels are copied to global branch disk space:
/global/shared/dump/*YYYYMMDDCC*

where:

YYYY = 4-digit year of run date
MM = 2-digit month of run date
DD = 2-digit day of run date
CC = run cycle (00, 06, 12 18).

These files have a different naming convention from that of NCO. A mapping of those file names is available in Appendix A.

If other files are needed, eg, for verification:

NCO maintains files for the last 10 days in CCS directories:

/com/gfs/prod/gdas.*YYYYMMDD*
and
/com/gfs/prod/gfs.*YYYYMMDD*

Locations of production files on HPSS (tape archive)

/hpssprod/runhistory/rh*YYYY*/*YYYYMM*/*YYYYMMDD*/
/2year/hpssprod/runhistory/rh*YYYY*/*YYYYMM*/*YYYYMMDD*/
/1year/hpssprod/runhistory/rh*YYYY*/*YYYYMM*/*YYYYMMDD*/

Examples:

/hpssprod/runhistory/rh2007/200707/20070715/
/2year/hpssprod/runhistory/rh2007/200707/20070715/
/1year/hpssprod/runhistory/rh2007/200707/20070715/

To see, eg, which files are stored in the 2-year archive of gfs model data:

d2n6 93 % /nwprod/util/ush/hpsstar dir /2year/hpssprod/runhistory/rh2007/200707/20070715 | grep gfs_prod_gfs
[connecting to hpsscore.ncep.noaa.gov/1217]
-rw-r--r-- 1 nwprod prod 6263988224 Jul 16 22:31 com_gfs_prod_gfs.2007071500.sfluxgrb.tar
-rw-r--r-- 1 nwprod prod 160544 Jul 16 22:31 com_gfs_prod_gfs.2007071500.sfluxgrb.tar.idx
-rw-r--r-- 1 nwprod prod 14814876672 Jul 16 22:23 com_gfs_prod_gfs.2007071500.sigma.tar
-rw-r--r-- 1 nwprod prod 80672 Jul 16 22:23 com_gfs_prod_gfs.2007071500.sigma.tar.idx

```
-rw-r--r--  1 nwprod  prod  7124057600 Jul 16 22:27 com_gfs_prod_gfs.2007071500.surface.tar
-rw-r--r--  1 nwprod  prod       33568 Jul 16 22:27 com_gfs_prod_gfs.2007071500.surface.tar.idx
-rw-r--r--  1 nwprod  prod  6262680576 Jul 17 01:49 com_gfs_prod_gfs.2007071506.sfluxgrb.tar
-rw-r--r--  1 nwprod  prod      160544 Jul 17 01:49 com_gfs_prod_gfs.2007071506.sfluxgrb.tar.idx
-rw-r--r--  1 nwprod  prod 14814876672 Jul 17 01:37 com_gfs_prod_gfs.2007071506.sigma.tar
-rw-r--r--  1 nwprod  prod       80672 Jul 17 01:37 com_gfs_prod_gfs.2007071506.sigma.tar.idx
-rw-r--r--  1 nwprod  prod  5868585472 Jul 17 01:42 com_gfs_prod_gfs.2007071506.surface.tar
-rw-r--r--  1 nwprod  prod       26912 Jul 17 01:42 com_gfs_prod_gfs.2007071506.surface.tar.idx
-rw-r--r--  1 nwprod  prod  6257581056 Jul 17 04:58 com_gfs_prod_gfs.2007071512.sfluxgrb.tar
-rw-r--r--  1 nwprod  prod      160544 Jul 17 04:58 com_gfs_prod_gfs.2007071512.sfluxgrb.tar.idx
-rw-r--r--  1 nwprod  prod 14814876672 Jul 17 04:47 com_gfs_prod_gfs.2007071512.sigma.tar
-rw-r--r--  1 nwprod  prod       80672 Jul 17 04:47 com_gfs_prod_gfs.2007071512.sigma.tar.idx
-rw-r--r--  1 nwprod  prod  6744496128 Jul 17 04:52 com_gfs_prod_gfs.2007071512.surface.tar
-rw-r--r--  1 nwprod  prod       31520 Jul 17 04:52 com_gfs_prod_gfs.2007071512.surface.tar.idx
-rw-r--r--  1 nwprod  prod  6249061376 Jul 17 08:18 com_gfs_prod_gfs.2007071518.sfluxgrb.tar
-rw-r--r--  1 nwprod  prod      160544 Jul 17 08:18 com_gfs_prod_gfs.2007071518.sfluxgrb.tar.idx
-rw-r--r--  1 nwprod  prod 14814876672 Jul 17 08:08 com_gfs_prod_gfs.2007071518.sigma.tar
-rw-r--r--  1 nwprod  prod       80672 Jul 17 08:08 com_gfs_prod_gfs.2007071518.sigma.tar.idx
-rw-r--r--  1 nwprod  prod  5284646912 Jul 17 08:12 com_gfs_prod_gfs.2007071518.surface.tar
-rw-r--r--  1 nwprod  prod       24352 Jul 17 08:12 com_gfs_prod_gfs.2007071518.surface.tar.idx
```

Appendix D

Sample entries:

```
# rotational input
*/*/anal/ROTI  =     biascr.$GDUMP.$GDATE
*/*/anal/ROTI  =     satang.$GDUMP.$GDATE
*/*/anal/ROTI  =     sfcf06.$GDUMP.$GDATE
*/*/anal/ROTI  =     siggm3.$CDUMP.$CDATE
*/*/anal/ROTI  =     sigges.$CDUMP.$CDATE
*/*/anal/ROTI  =     siggp3.$CDUMP.$CDATE
*/*/anal/ROTI  =     prepqc.$CDUMP.$CDATE
# optional input
*/*/anal/OPTI  =     sfcf03.$GDUMP.$GDATE
*/*/anal/OPTI  =     sfcf04.$GDUMP.$GDATE
*/*/anal/OPTI  =     sfcf05.$GDUMP.$GDATE
*/*/anal/OPTI  =     sfcf07.$GDUMP.$GDATE
*/*/anal/OPTI  =     sfcf08.$GDUMP.$GDATE
```

The left hand side is set of 4 patterns separated by slashes.

The first pattern represents the cycle (full date)
The second pattern represents the dump.
The third pattern represents the job.
The fourth pattern is a string that defines whether a file is optional/required input/output, eg:

DMPI - dump input from current cycle
DMPG - dump input from previous cycle
DMPH - dump input from two cycles prior
ROTI - required input from the rotating directory
OPTI - optional input from the rotating directory
ROTO - required output to the rotating directory (if the file is not available, a flag is set and the next job is not triggered)
OPTO - optional output to the rotating directory (save it if available, no worries if it's not)
ARCR - files to archive in online archive (should be required, but depends on setup of arch.sh)
ARCO - files to archive in online archive
ARCA - files saved to "ARCA" HPSS archive
ARCB - files saved to "ARCB" HPSS archive
(check arch.sh job for other HPSS options... current version allows for ARCA thru ARCF)
COPI - required restart and files to initiate experiment with copy.sh job (fcst input)
DMRI - prerequisite dump file for submit (used in psub, but not used in job scripts to copy data!)

The right hand side typically represents a file.

An asterisk on either side is a wild card. Eg:
***/*/arch/ARCR = pgbf06.$CDUMP.$CDATE**
The above entry in your rlist means that for any cycle, or any dump, the archive job will copy pgbf06.$CDUMP.$CDATE to the online archive.

If you change that to:
***/gfs/arch/ARCR = pgbf06.$CDUMP.$CDATE**
only the the gfs pgbf06 files will be copied to the online archive.

If you changed it to:
***00/gfs/arch/ARCR = pgbf06.$CDUMP.$CDATE**
only the 00Z gfs pgbf06 files will be copied to the online archive.

If you changed it to:
20080501*/gfs/arch/ARCR = pgbf06.$CDUMP.$CDATE
only the May 1, 2008 gfs pgbf06 files will be copied to the online archive. (Not a likely choice, but shown as an example)

Changing that first example to:
***/*/arch/ARCR = pgbf*.$CDUMP.$CDATE**
tells the archive job to copy the the pgb file for ***any forecast hour*** (from the current $CDUMP and $CDATE) to the online archive.

A more complex set of wildcards can be useful for splitting up the HPSS archive to keep tar files manageable. Eg:

all gdas sigma files go to ARCA HPSS archive
***/gdas/arch/ARCA = sigf*.$CDUMP.$CDATE**

gfs sigf00 thru sigf129 go to ARCB HPSS archive
***/gfs/arch/ARCB = sigf??.$CDUMP.$CDATE**
***/gfs/arch/ARCB = sigf1[0-2]?.$CDUMP.$CDATE**

gfs sigf130 thru sigf999 go to ARCC HPSS archive
***/gfs/arch/ARCC = sigf1[3-9]?.$CDUMP.$CDATE**
***/gfs/arch/ARCC = sigf[2-9]??.$CDUMP.$CDATE**